White Sands Space Harbor (WSSH)

Innovative Recycling Efforts February 2003

Agenda

- History
- Physical Location, Conditions, and Access
- Runways and Maintenance
- Location, Access and Conditions
- Used Oil Heater
- Steam Cleaning Pad
- Scrap Metal and Other Recycling
- Conclusion

NASA White Sands Test Facility

History

- White Sands Test Facility (WSTF) operates the White Sands Space Harbor (WSSH) on the U.S. Army's White Sands Missile Range
- Primary training area for space shuttle pilots
  - Approach and landing practice in the shuttle-training aircraft (STA), a highly modified Gulfstream II
  - T-38 chase aircraft
- In 1976, NASA selected Northrup Strip as the site for pilot training

NASA White Sands Test Facility

History, Cont'd

- A second runway was added, and in 1979, both lake bed runways were lengthened, allowing WSSH to serve as a shuttle backup landing facility
- The facility was used during the landing of STS-3 in March 1982
- WSSH became an emergency landing site, and the U.S. Congress designated the facility as the "White Sands Space Harbor"

NASA White Sands Test Facility

STS-3, Columbia Landing 1982

NASA White Sands Test Facility

Runways and Maintenance

- WSSH maintains two 35,000 ft lake bed, runways that serve for pilot training and backup shuttle landing
- Simulates the runways at Kennedy Space Center and Edwards Air Force Base
- A third, shorter, runway was constructed to simulate the landing sites in Morocco, Spain, and Gambia
- The hard-packed gypsum strips are groomed and striped continually
  - Leveled to a tolerance of ± 1 in/1000 ft
- Certified yearly to support the weight of the shuttle

Location and Access

- Remotely located on the world's largest gypsum dune fields in the Tularosa Basin, east of the San Andres Mountains, adjacent to the White Sands National Monument
- The Facility is 30 miles west of Alamogordo, NM with access through Holloman Air Force Base
- Access from Las Cruces is via Hwy. 70 past the Small Missile Range, a commute of over 60 miles
- Roads are either paved or hard-packed gypsum with frequent encounters with natural and alien desert critters

Conditions

- Intense direct and reflected light necessitate the use of skin protection and sun glasses to prevent “snow blindness”
- Summer temperatures often exceed 110 ° F and winter temperatures can dip below 0 ° F
- The average annual rainfall is 10 inches
- The peak wind gust was 113 mph; however, winds as low as 20 mph can lift the white gypsum dust off the lake bed and heavy winds cause “white-outs” with visibility shrinking to less than 10 feet
- Equipment air filters become clogged in a few hours and personnel use unvented goggles and dust masks during storms

Conditions, Cont'd

- WSSH has no potable water
- Fresh, non-drinkable, water is transported from a 40 gallon/minute well two miles from the Operations Center
- The ground water, confined to fractures in the hard gypsum mantle, is found at less than 6 feet below the surface and is very alkaline (pH 8+) with 76,000 ppm TDS
- All drinking water is brought in from off-site
- The alkali soil is predominately $CaSO_4$ with traces of salt
  - Resembles soft rock, a very dense selenite

Natural Desert Critters
Diamondback Rattlesnake

Natural Desert Critters, Cont'd

Coyote

Alien Desert Critter

- An Oryx population introduced from Africa in 1974 has exploded from 96 to 4,500 today

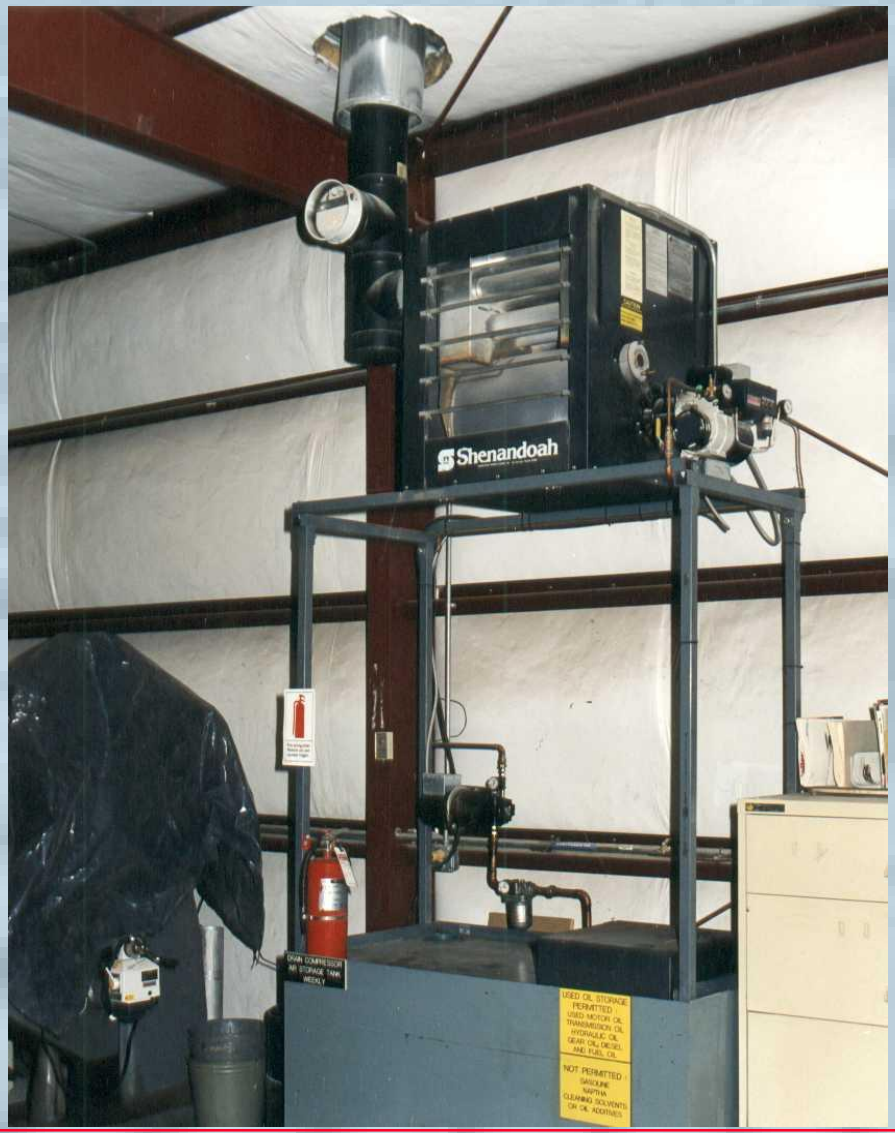
Used Oil Heater

- WSSH installed a UL-approved used oil heater in their Heavy Equipment Shop to recycle oil and provide heat in the remote area
- The Shenandoah 175K BTU heater is fitted with an 8-inch round 4-foot tall stack (to code) and a 250 gallon UL-approved storage tank fitted into a secondary storage tank
- The system meets 40 CFR 279 standards for required oil analyses, BTUs, and “Used Oil” labeling
- The heater consumes 1.25 gallons of oil per hour and is thermostatically controlled to shut down in the event of loss of fuel, electricity or air

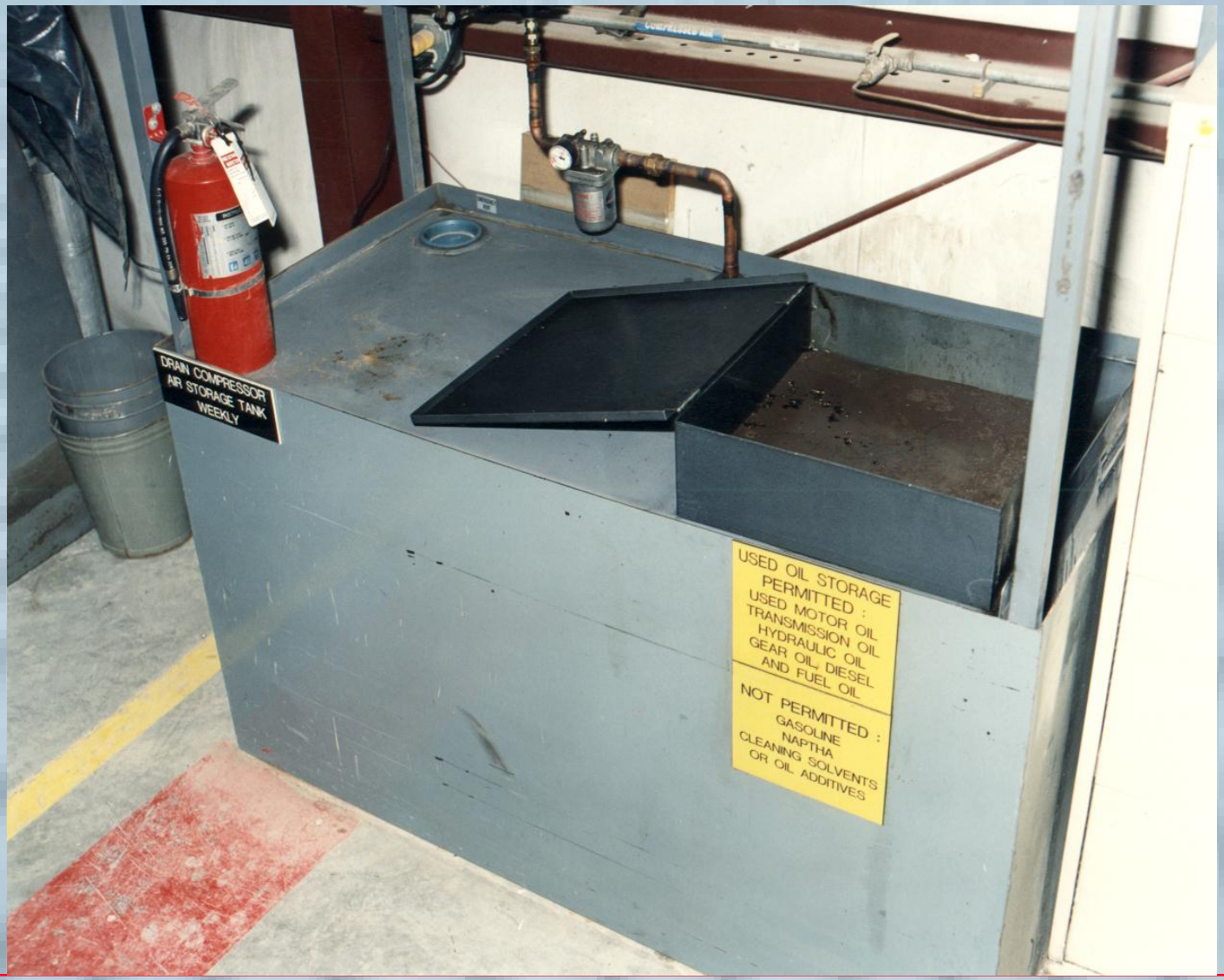
Used Oil Heater, Cont'd

- On cold days the heater warms the shop in less than 20 minutes
- In addition to oil used in heavy equipment, the heater consumes oil generated by the steam cleaning pad belt skimmer
- Since the installation of the heater (1999), WSSH has not transported any used oil for recycle or disposal, avoiding labor and transportation costs

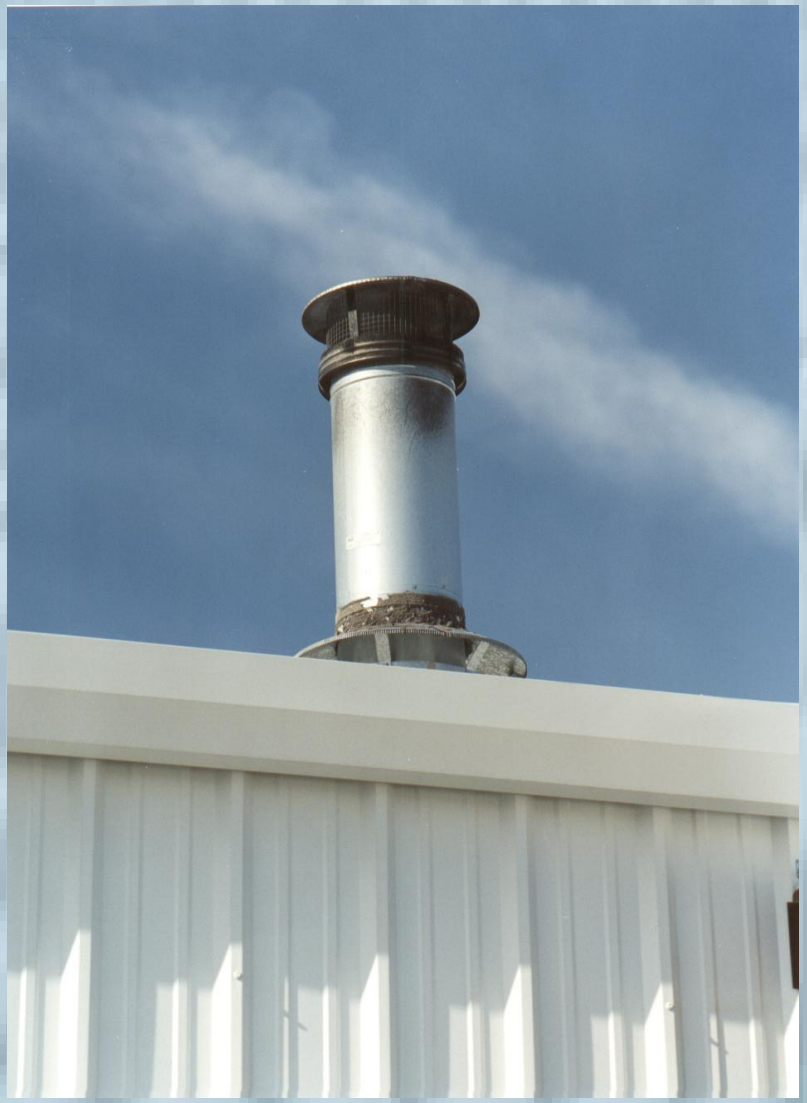
Used Oil Heater, Cont'd



Used Oil Heater, Cont'd



Used Oil Heater, Cont'd



Steam Cleaning Pad

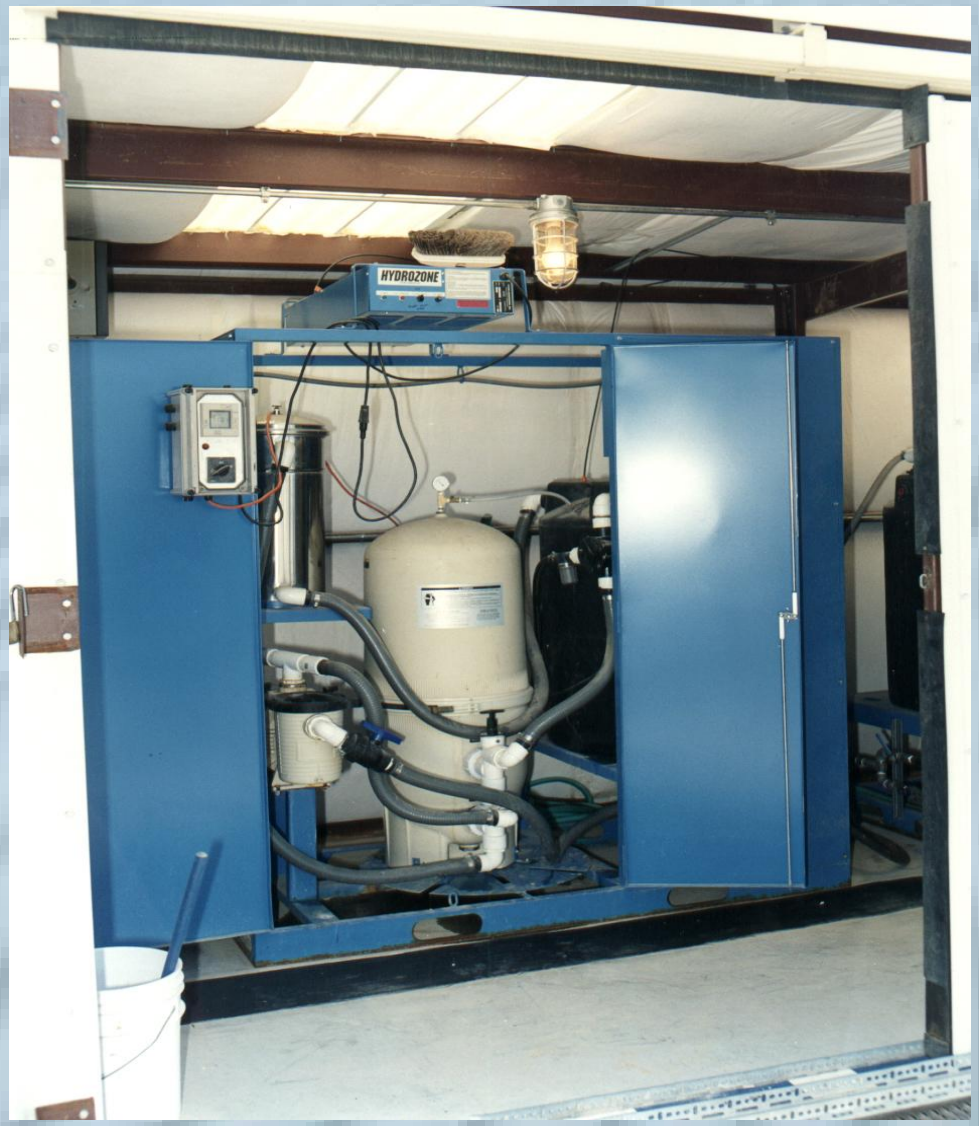
- Assessed need for a Steam Cleaning Pad at WSSH
  - Accumulated gypsum on equipment is very corrosive and needs removal
  - Accumulated grease and oils require removal to perform proper heavy equipment maintenance
  - Accumulated wash water residue must be contained and disposed of in a manner that complies with environmental regulations
  - Stormwater from a steam cleaning area must be dealt with in an environmentally safe manner
  - The system cannot require large quantities of hard-to-get water

Steam Cleaning Pad, Cont'd

- Construction of the steam cleaning pad completed in 2000
- The concrete pad with sump is a continuous pour that can support extremely heavy equipment
- Recycles all process water
- Collects and uses stormwater from rain/snow events
- The system provides a steam wash, separates (filters) sediments, removes (strips) oil and grease, and adds ozone to control bacterial growth and condition the water
- Utilizes general swimming pool procedures for clarification, filtering, and pH adjustment of the high TDS alkaline water

Steam Cleaning Pad, Cont'd

Steam Cleaning Pad, Cont'd



Steam Cleaning Pad, Cont'd

Steam Cleaning Pad, Cont'd

Scrap Metal and Other Recycling

- WSSH recycled 40,000 lbs. of 4’ X 8’ X ½” armor protection steel
- The plating was used to cover four Automated Landing Systems for orbiter guidance
  - Protect equipment from falling debris during WSMR missile testing
- The systems represent millions of dollars of irreplaceable equipment and technology
  - Minimum $60 million replacement cost each

Automated Landing System Shelter

Automated Landing System Shelter

Other Recycling

- Equipment and materials that WSSH has transferred, salvaged, refurbished, repaired, and recycled
  - Heavy equipment, vehicles, and trailers
  - Buildings and shelters
  - Generators and pumps
  - Tanks and secondary containment
  - Machinery, compressors, and tools
- Estimated value new $4.2 million
- Estimated value now $1.3 million
- Most of the equipment/materials are acquired from either DRMO or WSMR

Conclusions

- WSSH, a shuttle backup landing/pilot training facility, is located in a very remote, hostile environment
- Runway grooming requires a fleet of well cared for equipment, maintained and operated by a highly trained team
- Prompted by remoteness, austere conditions, State and Federal Regulations, budgets, and the need for a method of doing a job correctly, these innovative engineers and technicians have found ways to recycle and reuse available resources